Dissolution of parental unions in Norway

~The future share of women/men being single parents

Haakon Ingvaldsen

Master thesis for the Master of Economic Theory

and

Econometrics degree

Department of Economics

UNIVERSITETET I OSLO

16.11.2009

Preface

When I had my first course in demography in 2005, I did not picture myself as a father. Now, one course in demography and about 20 in economics later, I am a father and actually living in a parental union.

I would like to give a large thanks to my supervisor, Nico Keilman, for good comments and quick responses to my e-mails. Both Nico Keilman and Øystein Kravdal inspired me to choose a demographic subject matter for this thesis as they both have been stimulating lecturers in demography.

None other than me are responsible for any remaining errors, or for the interpretations that are made.

My most profound gratitude goes to Bjørg Bogstrand, and to Jo, my most valuable assets.

Haakon Ingvaldsen

Oslo, November 2009

Contents

1. Introduction

There are several reasons for why pair dissolution in general is an important field of study. Nevertheless, in this thesis, the focus will mainly be on the dissolution of parental unions. The disruption behaviour of such families is of much greater societal concern than the dissolution of childless relationships.

1.1 Divorce trends in Norway

In the 60s and 70s, attitudinal changes in the Norwegian population became visible. Marriage dissolution became accepted in a larger scale than before. Higher divorce rates followed as a natural consequence. Soon, young people entered marriage later than before, only a few married without cohabiting first, and previously unconventional forms of union formation faced easier acceptance in the society. The number of consensual unions rose, hand in hand with the number of divorces. Today, it is common to have children together outside of a marital union, and those who marry have often lived in a consensual union for a long time prior to the wedding. Figure 1 displays the divorce trend(s) in Norway. From a yearly number of around 2,500 divorces in the sixties, it now has come up to well above 10,000 divorces.

According to Statistics Norway, the yearly average of the total number of births in Norway in the sixties was approximately 66,000. About 3,000 of these were the result of unmarried childbearing. In 2008, on the other hand, the total number of births was nearly 62,000, and the number of births happening outside of a marital union had increased to 33,400[1]. This

[1] Numbers taken from Statistics Norway: http://www.ssb.no/aarbok/tab/tab-070.html

gives a good picture of a continuation of attitudinal and possibly ideational changes in the Norwegian society.

Factors related to the economy, such as improved living standards, must also have contributed to the increasing number of divorces during this period. A divorce is somewhat costly, and if one can overcome the financial consequences (for instance the expense of establishing separate homes) following from it, one may be less reluctant to end an "unhealthy" union.

Figure 1: [2]

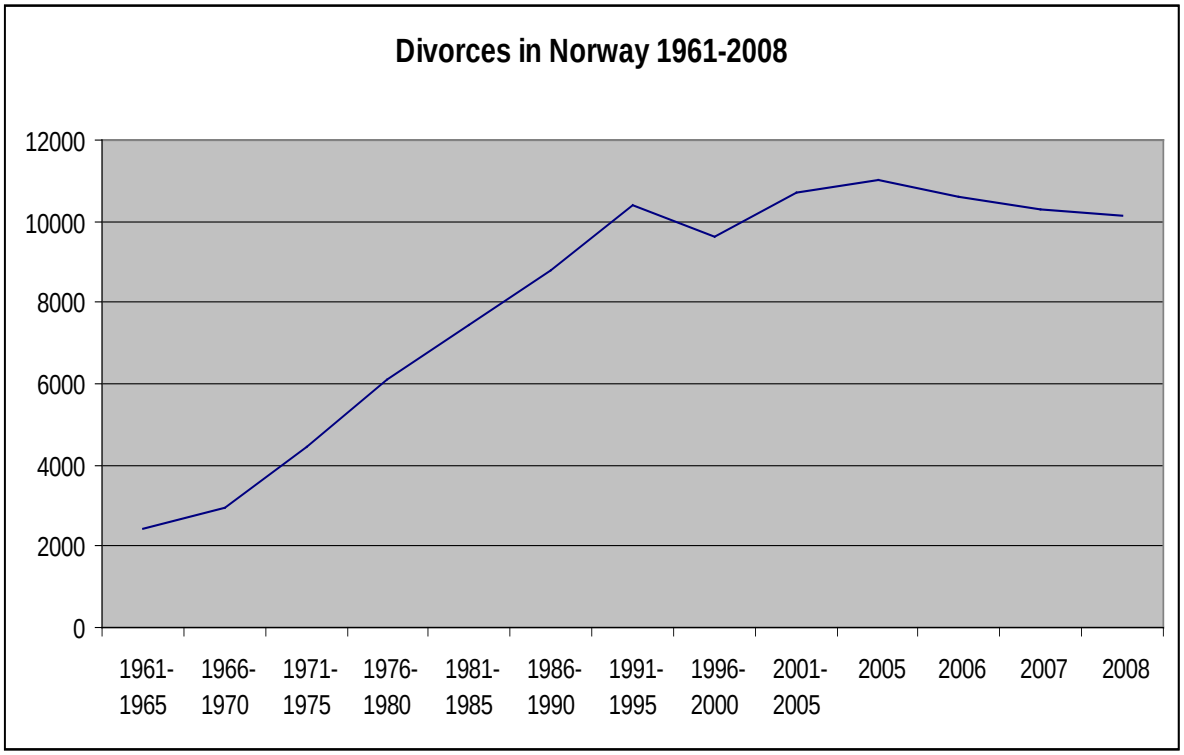


Figure 1 pictures a small decline in the number of divorces during the last years. One possible hypothesis could be that the rising number of consensual unions and the continuously changing attitudes toward non-marital motherhood may be one reason for this

[2] Numbers taken from The Statistical Yearbook of 2009 of Statistics Norway: http://www.ssb.no/aarbok/tab/tab-099.html

change in the divorce trend. Certainly, the transition into formal marriage must have increased as regard to selectivity throughout the period. This could indicate that the marriages of today are more stable (Hoem and Hoem, 1992) than those, say, 30 years back. This view could imply that pre-marital cohabitation has played the role of sorting out the least robust unions, or, by the same token, converting the most stable unions into marriage.

Relatively recent findings in the U.S.(Teachman, 2002) agree to such reasoning. Throughout the same period as discussed here, it is shown that, in the U.S, the marriage-dissolution risks of black couples rose less rapidly, compared to those of white couples. The declining economic position of many blacks and less favourable marriage-market conditions for many blacks, the growth of alternatives to marriage and greater acceptance and prevalence of unmarried childbearing and cohabitation, are all mentioned as reasons for why this is the case. Blacks have delayed marriage more than whites, and are less likely than whites to ever marry. Thus, blacks in the U.S. who marry, or want to marry, seem to be a very select group of all blacks. Accordingly, the blacks who marry are more selective of individuals they think are less likely to divorce.

Clearly, these characteristics and findings cannot be compared directly to the Norwegian population of today. Although there are an increasing number of consensual unions in Norway, as shown in chapter 5.1 of this thesis, the total number of married couples is also increasing.[3] The group of married couples consists of more households than the group of consensual unions and the increasing number of cohabiters is offset by the rise in the number of married couples (/the decline in marriage dissolution). In relative changes, however, consensual unions show a steeper climb compared to marital unions. Furthermore, the number of one-person households has increased during the last decades.

[3] The number of households consisting of a married couple without children is expected to increase, while the number of households consisting of a married couple with children is expected to decrease.

Statistics Norway[4] shows that the share of cohabiters among those who live with a partner has not increased in the recent years. Among the cohabiters, the highest share is in the age group 25-29 years, for both men and women. Women start cohabiting 2-3 years sooner than what men do, and thus there are more women than men in this age group.

However, in a larger scale than earlier women are seen to move to the cities for education and work. One result of this is that marriage and childbearing is postponed in Norway. Such postponement may bring about effects as regard to selectivity and may be one reason for the observed decline in the number of divorces in Norway.

Official population statistics contain little information concerning the stability of consensual unions. As the growth in consensual unions was immense in the same period as divorce rates rose, any analysis that involves formal divorces alone will give a rather incomplete picture of union stability in Norway.

1.2 Children's well-being

A traditional assumption is that a family with both parents living in the same household as the child is a better environment for children's development than is a single-parent household. Mothers and fathers are regarded as important resources for the child. Each of the parents is a source for emotional support, practical assistance, information, guidance, and supervision. Further, the presence of two adults in the household allows parents to serve as role models from whom children learn different types of social skills. Such skills can be cooperation, negotiation, or compromise. Disruption of a parental union will of course lead to one of the parents being absent from the household, and this may be problematic for the child's socialization. Following the dissolution of a parental union, many children experience a decrease in the quantity and quality of contact with the noncustodial parent (Amato, 1993).

[4] See for instance http://www.ssb.no/samboer/

When one of the parents is absent, this may increase the likelihood of the child experiencing problems such as poor academic achievement and misbehaviour. Research on parental divorce in childhood and demographic outcomes in young adulthood for Britain, by Cherlin, Kiernan and Chase-Lansdale (1995), show that “by the age 23, those persons whose parents divorced were more likely to leave home because of friction, to cohabit, and to have a child outside marriage than were those whose parents did not divorce” (Cherlin et al., 1995, p 2).

Several other studies have discovered that partnership instability tends to be detrimental to the well-being of the children involved, see for instance Amato (1993) for an organization of different perspectives or Amato (2000) for a summary of the empirical literature. For a study on the well-being of adolescents following parental dissolution, see for instance Brown (2006). Brown (2006) demonstrates the importance of distinguishing transitions into and out of cohabiting stepfamilies from other types of transitions. One interesting point, which is referred to in that paper, is that the formation of a cohabiting stepfamily following divorce, may be associated with more misbehaviour and worse school performance among teenagers. Another finding, which is consistent with other assertions, is that the dissolution of a two-biological-parent family or a stepfamily into a single-mother family is not related to well-being. In other words, parental divorce seems to be relatively less traumatic for teenagers than for younger children.

As with adults, one could imagine that the disruption of a family could have positive consequences for some children. The development of especially close relationships with their custodial parents, or the escape from a long term aversive home environment, could both be explanations for why some children will be better off after a parental dissolution. Amato (2000) refers to a few studies where such effects are emphasized, but, at the same time, he points out that only a minority of divorces are preceded by a high level of chronic marital conflict. Thus, the conclusion is that divorce probably helps fewer children than it hurts.

1.3 Policy implications

Individual demographic behaviour affects both the population structure and the population size. In Norway, both the number of one-person households and the number of single-parent households has increased over the last decades[5].

The number of one-person households was approximately 426,000 in 1980. This figure has exactly doubled since then: in 2009 the number is 852,000. In the population as a whole, roughly as many women as men live alone. There is a large surplus of men in the group aged 30-45 years, this surplus is greatest in the sparsely populated areas of Norway and one reason for this is that women in a greater extent than earlier are seen to move to the largest towns in order to study and find work. On the other hand, the single women dominate the older part of the population compared to single men, which to a large extent can be explained by the mortality differences between men and women.

Single parent households have also increased. Lone mothers living with young children (youngest being 0-5 years) increased rapidly and nearly doubled from about 16,000 in 1980 to 35,000 in 1990, but then, in the last 20 years the number has decreased to nearly 29,000 in 2009. The number of lone fathers with young children (youngest being 0-5 years) has increased throughout the whole period, from 600 in 1980 to 2,900 in 2009. The number of single parents living with older children (youngest being 6-17 years) increased for both mothers and fathers from 1980 to 2009. Lone fathers increased from 15,000 to almost 20,000, and lone mothers from 32,000 to 70,000.

Obviously, this is a trend that has been visible for some time now, and it is one of the outcomes of the greater instability and informality of partnerships in Norway. Population forecasts, such as the one presented in this thesis, show that this trend is expected to

[5] Source: Statistics Norway: http://www.ssb.no/familie/tab-2009-04-02-03.html

continue. The trend is often associated with later and less childbearing, and the postponement of childbearing until a stable union is established (Steele, Kallis, Goldstein and Joshi, 2005).

Yet an increasing number of parental unions are being dissolved (and established) in Norway, and the majority of single-parent families are the outcome of partnership dissolution, rather than unpartnered motherhood. At the same time, a growing number of stepfamilies are being formed. These families are often exposed to extra difficulties and they seem to have higher dissolution risks than for instance first marriages (Kravdal and Noack, 1988).

Forecasts that show demographic developments of this kind may be used for policy purposes. The changing demographic and social structure has implications for the structure and the design of models of social security in the economy, and may be of interest for the population at large.

According to Statistics Norway[6], 109,600 persons received social security in 2007. This had a cost of 4.300.000.000 NOK. 3 out of 4 receivers were single, 20 per cent were lone parents (with children under 18 years of age) and 65,000 children lived in a family that received social security. 3 out of 4 lone parent-receivers were women, while 56 per cent of all receivers were men.

All of these figures showed a decline compared to the years prior to 2007, except for the share of lone parents that received social security. In 2006 this share was 15 per cent. In this thesis, I show that one-person households and single-parent households are expected to increase in the future.

[6] Source: http://www.ssb.no/ssp/utg/200805/08/

1.4 Summary

The main aim of this thesis is to make a forecast of the future share of single mothers and fathers in Norway, and to identify the factors that influence the probability of men ending up as single fathers compared to the probability of women ending up as single mothers after dissolution of parental unions. In order to make this forecast, I have used the macro simulation program LIPRO (LIfestyle PROjections) version 4.0, which is based on the methodology of multi-state demography. This is a macro model that simulates groups with certain characteristics. In real life, it is the individuals, or the households, that behaves in a certain manner.

Since the household projection contains only a few demographic factors at the macro level, there are not many possibilities for a thorough analysis. The various sensitivity variants computed in this thesis are meant to investigate the consequences of higher or lower parameter values for the processes that determine the proportions of single mothers and single fathers. In other words, my strategy is to analyse how sensitive changes in relevant LIPRO-rates are for the share of single mothers and single fathers in Norway. This gives me the answer to the following two questions; 1. Which of the components of change, or processes, is of the most importance to the share of single mothers and fathers? and 2. How trustworthy are the forecasted changes in the future shares of women/men being single parents?

In chapter 2, I give an overview of the factors that influence parental disruption. Many of them are outside of LIPRO's reach, as they are aspects of individual behaviour. If one is interested in analysing such behaviour, individual data must be collected. Chapter 3 gives a rather non-technical presentation of the LIPRO model, and in chapter 4, the data used for this thesis is presented.

Chapter 5 includes a household projection for Norway for the years 2002-2032, which indicates a continuation of trends that have been observed for some decades already; fewer couples with children, more cohabiting couples, and more single-person households.

Next, a household projection for the men and women in the age-group 30-49 years being single fathers and mothers for the years 2002-2032, or my Benchmark simulation, is presented. The Benchmark simulation shows that the share of single mothers in the age group 30-49 years decreases, while the share of single fathers in the age group 30-49 years increases. Here, I divide the age group in two, and find that the greatest contributions come from the "younger" women and the "older" men. I also construct a female/male ratio for the shares, and find that from having five times as many mothers as fathers in 2002, this is expected to fall. In 2032, the female/male ratio is expected to be 3.

Further, 8 different sensitivity computations carried out in order to investigate how sensitive changes in LIPRO-rates are for the proportion men or women in the age-group 30-49 years being single fathers or mothers, are presented. The central results here are that pair dissolution seems to be more important than pair formation, that dissolution of consensual unions is more important than the dissolution of marital unions and that marriage is less important than cohabitation. These results agree with other findings in the literature. As the simulations consist of counterfactual changes, and these sensitivity analyses give the same pattern for the female/male ratio as the Benchmark-simulation, I suggest that the change in the ratio and thus also in the shares are real.

The last part of chapter 5 contains two types of sensitivity variants that consist of counterfactual changes, computed in order to investigate the robustness of the household projection. I find that the forecasted changes in the shares of single mothers and fathers are real.

2. Theory

A partnership that experiences the arrival of children signals that it is well-functioning. Whether the children are planned or not is of course of significant importance here. Childless unions on the other hand are associated with increased risks of marital breakdown (Wilcox, 1891 ; Hoem and Hoem, 1992).

Here, I will give a brief overview of relevant factors that influence the dissolution risks of parental unions.[7]

Number of children

As mentioned, families with children signal that they are healthy. Their investments in the children must imply that they perceive rewards for themselves and for their children. For a study of disruption of unions in Sweden, Hoem and Hoem (1992) find empirical support in some of their earlier work that gives consent to the argument that common children lead to lower dissolution risks. An additional child reduces the risk even further. However, they show that three-child families display higher dissolution risks than two-child families. In order to understand why this is the case, one would need to know the reasons for why these families chose to have an additional child. Without learning this, it is impossible to say whether these families already were halting or if an additional child made the family life more difficult.

[7] Civil status also matters, although it is not listed as a factor in this overview: cohabiters face higher dissolution risks than the married. It sort of comes clear anyhow, that is at least my intention.

Vignoli and Ferro (2009) found that additional children lower the risk of marital breakdown in Italy. They also point out that their findings agree with what is the "usual and theoretically expected results".

Children's age

Another typical finding, which also Vignoli and Ferro (2009) came about, is that dissolution risks are lowest when the child is relatively young. People may be reluctant to separate when they have a young child. Bumbass and Lu (2000) refer to Andersson, who found divorce rates to be lowest when the children are young. Nonetheless, as the child grows older, the risk of separation is shown to rise again (e.g. Andersson, 1997; Bumbass and Lu, 2000).

Steele, Kallis, Goldstein and Joshi (2005) found that preschool children have a stabilizing effect on their parents' relationship, whether they are married or they live in a consensual union. Andersson (2002) found similar results after using data from the fertility and family surveys of 15 European countries and corresponding data from the USA.

Gender Relations

In a study of gender and family stability, Oláh (2001) found, comparing Sweden and Hungary, that in Sweden, if the father took some parental leave with the couples' first child, the dissolution risk is lower than otherwise. Involvement in childrearing affects family stability in a positive way. It is suggested that the risk of possible conflicts are lower in unions were both parents are engaged in care and economic responsibilities.

Union starting age and premarital cohabitation

Hoem and Hoem (1992) show that in Sweden, women who started their first union as a teenager developed a dissolution risk that was considerably higher than for the ones who started cohabiting later. This can be explained as a result of the teenager not having had the possibility of performing a sufficient mate search. In fact, the dissolution risk was particularly high, even later in life.

Premarital cohabitation is also shown to give higher marital-dissolution risks. Marrying directly has become rather unusual, and those who do so come from a select group (Hoem and Hoem, 1992).

Different people make different choices. For instance a woman who is more dissolution-prone from the beginning may choose cohabitation over marriage and/or early union formation in stead of waiting.

Pregnancy

Whether pregnancy occurs before or after a consensual union is converted into a marriage is not that important, according to the analysis of Hoem and Hoem (1992). A woman who is pregnant, and married (or in a consensual union), should have a reduced dissolution risk as a consequence of the pregnancy.

Whenever the birth occurs prior to the formation of a first union, on the other hand, the dissolution risks are increased. This may indicate that the couple had problems that restrained them from marrying or living together. Another possibility is that the father is not the current partner.

Whether first or second union

It is natural to assume that persons who have lived through family disruption are more careful when it comes to the selection of a new partner, or to the whole idea of ever joining a union again. An opposing effect will be that persons living alone become more appreciative of the benefits of living in a union. These families are often exposed to extra difficulties and they seem to have higher dissolution risks than for instance first marriages (Kravdal and Noack, 1988).

Hoem and Hoem (1992) find that a second union that is followed by the dissolution of a consensual union has a higher dissolution risk than if the first union was a marital union.

Family background and race

An aspect concerning family background is the parents' educational level. Hoem and Hoem (1992) suggest that there may be something in the upper and middle classes that makes dissolution an acceptable possibility when a union does not function as desired. The rather vague conclusion is explained by small group sizes. Nonetheless, they show that daughters of middle- and higher-level employees turned out to have dissolution risks that were higher than those of other respondents.

Parental divorce is also associated with higher rates of marital instability in the second generation. See for instance Amato (2000), or Kiernan and Cherlin (1999) who found that children are more likely to experience a divorce if their parents have experienced a divorce.

As mentioned in my introduction, Teachman (2002) shows that, in the U.S, blacks are less likely to marry than whites. This influences the risks of marriage-dissolution in favour of the blacks. However, many fewer blacks marry, compared to whites. This means that blacks are more often than whites living in informal parental unions. Since the literature suggests that children who are born in cohabitation are exposed to higher disruption risks than children

born in marriage, such as in Andersson (2002), white children seem to have better prospects than black children in the U.S. In another study, Rendall (1999) projects that 85% of black mothers will raise their children, either in single-mother families(70% of black mothers), or in a parental union formed by single mothers(15% of black mothers). Intact two-parent families among whites are projected to remain at its present level of 60%.

Religion

Hoem and Hoem (1992) found that religious active women had much lower dissolution risks after entry into motherhood. In Italy, civil marriages are more likely to experience a breakdown than religious ones. Vignoli and Ferro (2009) suggest that individuals who choose civil marriage are characterized by more secularized values.

Educational level

The risks of union dissolution may depend on the educational level of those involved, but the influence of education on the risk of divorce is somewhat theoretically ambiguous. Education may produce conditions that enable couples to have more children. At the same time, it may produce conditions that make partners resolve conflicts and protect the relationship. On the other hand, alternatives to both partnership and parenthood open up with education (Bumpass and Lu, 2000). Women with higher education have higher labour market prospects and earning potential than women with low or none education. This could lead the woman into becoming less family oriented and easier break out of a marriage.

Oláh (2001) found that a mother's education had a stronger effect than what a father's education had. The parent's current educational attainment proved to be important regarding disruption risks. Those who had the lowest level of education had the highest dissolution risks. This may suggest that some education is important for family stability.

Employment

Vignoli and Ferro (2009) find that women in employment in Italy, either temporary or permanent, “are roughly twice as likely to separate as non-working women”, and that “the dissolution risk increases with the woman’s educational level: by 31%, passing from low to high education” (Vignoli and Ferro, 2009, p 17).

Oláh (2001) shows that labour-market attachment of mothers influence family disruption risks significantly in Sweden. However, this is not the case for fathers.

When employed, it becomes easier to cope with the economic set-back of a family disruption. It becomes easier to find new living arrangements. Another factor that should influence dissolution risks in a negative way is that when employed and possibly hard working, one might grow into becoming less family oriented.

3. LIPRO

I have used the macro simulation program LIPRO (LIfestyle PROjections) version 4.0 in order to make my household projections and the sensitivity variants for Norway for the years 2002-2032. LIPRO is based on the methodology of multi-state demography, but it also includes several extensions to solve particular problems of household modelling. See http://www.nidi.knaw.nl/en/projects/270101/ for a description of the program.

LIPRO is a macro model that simulates groups with certain characteristics. In real life, it is the individuals, or the households, that behaves in a certain manner. Such behaviour is often analysed by the use of models for life cycle analysis and individual data. These types of techniques for simulating individual behaviour are something quite different than what is done in LIPRO. One example of such a model is the MOSART-model of Statistics Norway[8].

This summary of LIPRO is based upon the descriptions by Keilman and Christiansen (2009), Van Imhoff (1995) and Keilman and Brunborg (1995).

3.1 The model

In order to make a household forecast in LIPRO, the jump-off population must be split into groups defined by household position, age and sex. Here the jump-off population is the Norwegian population on 1 January 2002. This population is split into groups defined by nine different household positions, 5-year age groups (0-4, 5-9, … 85-89, 90+) and sex. The household positions are:

[8] See http://www.ssb.no/forskning/modeller/mosart/index.html for a description of the micro simulation model MOSART

CHLD – dependent child living with one or both parents.
COH0 – living in a consensual union without dependent children.
COH+ – living in a consensual union with dependent children.
MAR0 – living with a spouse without dependent children.
MAR+ – living with a spouse and dependent children.
SIN0 – person living in a one-person household.
SIN+ – single mother or father.
OTHR – living in a private household, but not in any of the positions 1-7.
INST – living in an institution for the elderly.

In order to make the projections as detailed as possible, one would like to have many household positions. However, the availability of data imposes some restrictions. The nine household positions above were chosen to be as detailed as possible taken this into account (Keilman and Christiansen, 2009).

"Children" are defined as persons less than 25 years of age living in the household of one or both parents. Cohabiting persons include those who report to have a marriage-like relationship with another person without being married to the partner, but irrespective of the partner's sex. Cohabiting persons can have any marital status. The category of married persons consists of those who are currently married and live together with the spouse. A person who occupies one of the remaining 6 household positions (the category CHLD is, of course, an exception) may have any marital status. For instance, a lone parent may be married (in that case, he or she will usually be separated, but not divorced), and both partners in a cohabiting union may be married (but not to each other). (Keilman and Brunborg, 1995). An adult aged 25 or over who still lives with his or her parent(s) belongs to the category "other". People living in institutions are restricted to ages 65 and older.

Over time, it is possible for individuals to move between certain household positions. These movements are called internal events. Individuals can also join or quit the population through birth, death, immigration and emigration. These changes in the population are called external

events. Events are modelled using rates that are dependent upon age, sex and household positions.

Not all internal events are logically possible. With nine household positions, there are 8 x 9 = 72 possible candidates for transitions between household positions. 39 of these transitions are possible, 33 are not. Restricting ourselves to private households, neglecting the possibility of individuals being institutionalized, there are 7 x 8 = 56 candidates for changes of position. 28 of these candidates are possible, 28 are not. For instance, it is not possible for a person to go straight from MAR+ to COH+. The person has to become either a single person household or a single mother or father first. By assumption it is not possible to move directly from one relationship into another relationship, and in this case two separate events are needed in order to move from MAR+ to COH+. Moving from SIN0 to MAR+ is another example of an impossible event. This is because events are defined as changes that take place in an infinitely short space of time, and two separate events are also needed here. This can happen in two different ways; SIN0 → SIN+ → MAR+ or SIN0 → MAR0 → MAR+. It is also impossible for a child to become institutionalized since, by assumption, the institutionalized population is restricted to ages 65 and older, and it is only possible to move back to being a dependent child for individuals under the age of 25 who live in one-person households without children.

The LIPRO model can be written as $V_{t+1} = P_t V_t + Q_t I_t$, where V_t is a column vector of the population at time t, broken down by household position, age and sex; I_t is a column vector of the population that has immigrated during the time period (*t, t+1*), while P_t and Q_t are square matrices containing time-dependent rates for internal events, births and deaths, defined by age, sex and household position.

International migration is specified as net immigration, the number of net immigrants, and thus is not modelled through rates. This means that the vector I_t contains absolute numbers.

3.2 Consistency in LIPRO

LIPRO does not model the behaviour of households, but the one of individuals. These individuals are characterised by their household statuses. This opens up the possibility of inconsistency between the attributes (Van Imhoff and Keilman 1991, Van Imhoff 1992; Christiansen and Keilman 2009). Internal consistency rules have to be formulated in order to solve this problem. For instance, if not a two-sex algorithm is included, male marriages and divorces will not equal the number of female marriages and divorces. In the same way, male entries into cohabitation have to correspond to female entries into cohabitation in a certain time period, and rules that ensure that this is the case must be formulated. One common way to solve the consistency problems is to make use of the harmonic mean solution. Whenever a projected number of events fail to achieve consistency, the program adjusts the number of events according to the harmonic mean. For instance, if the number of male divorces is different from the number of female divorces, the harmonic mean is calculated and both events are given this number. For my household projection, the harmonic mean solution has been deployed.

External consistency requirements are formulated to ensure that certain types of events are equal to a fixed number. Here, for instance, the total number of births and the net immigration has been set at the levels forecast in the 2005[9] population projection by Statistics Norway, and the number of places at the institutions for the elderly is set to be 41000 during the whole period. (Christiansen, 2008)

LIPRO uses bookkeeping equations to update the population. As mentioned earlier, the jump-off population was broken down into groups defined by age, sex and household position. LIPRO updates the vector V_t based on consistent events, for each group.

[9] Statistics Norway published a new population forecast in May 2008, which is not included in the present household projection.

4. Data

The presentation of the data used in this thesis will mainly follow similar presentations made by Christiansen (2008) and Keilman and Christiansen (2009). This is because of the same data being used in the present analysis.

The data were prepared for use in the LIPRO model by Nico Keilman and Juha Alho for a project on stochastic household forecasts.

In order to specify the jump-off population, data from the Norwegian Population and Housing Census held on 3 November 2001 has been used. In this census, the dwelling definition of a household was used. This means that all persons living at the same address counted as part of the same household. In the census the head of the household was asked to list the other members of that household, and then specify what kind of relationship he or she had to those people.

Occurrence-exposure rates for changes of private household position (the internal events) were estimated by using data from 1997-2002 and for ages 16-79, from the Statistics Norway's Survey of Living Conditions. The sample size was approximately 5,000 in 1997. The Survey of Living Conditions is a large panel survey held annually, and the people taking part in it are asked different types of questions. Typical questions are questions about cohabitation, the relationship of each household member to the other members of the same household and the number of persons in the household. In this census, the housekeeping definition of a household was used. This means that all persons living together and having common housekeeping are defined as a household. It is assumed that there is no difference when it comes to changes in household compositions between the two definitions of a household. From the survey, and changes in reported household positions, Nico Keilman and Juha Alho deduced 3,645 household events of 27 different types, and 22,462 years of

exposure[10]. The occurrence-exposure rates were computed for each sex and each five-year age-group.

Rates for movements between institutions and private households, both entry rates and exit rates, have been adopted from the earlier household forecast for Norway by Keilman and Brunborg (1995). The number of places in institutions for the elderly was taken to be 41,000, the same number as Statistics Norway estimated the number of elderly living in institutions to be in the period 2003-2005.

Birth rates broken down by five-year age-group and household position of the mother were taken from the earlier household projection by Keilman and Brunborg (1995), and adjusted proportionally so that the number of live births in the first projection interval in the present household projection, 2002-2006, matches the number of live births recorded by Statistics Norway in the period 2002-2006.

Death rates by five-age year-group, sex and household position were estimated based on data from the Norwegian population register. Deaths and exposure times by marital status, age and sex for the years 1995-1999[11] were supplied by Øystein Kravdal. The death rates were distributed in the following way; the death rates of the ”currently married” to household positions COH0, COH+, MAR0 and MAR+, the death rates of the never married to persons with household position CHLD, SIN0 and OTHR, and the death rates of the divorced to single parents, SIN+. The death rates for the institutionalised population have been set to double the level of those living by themselves, or never married, within the corresponding sex- and age-group. This is because of the fact that individuals living in an institution have higher mortality than the ones living in private households. In the end, the death rates were adjusted so that they implied numbers of deaths for the period 2002-2006 that were close to observed numbers.

[10] They discarded information about two or more household events in one calendar year. However, this occurred rarely. (Keilman and Christiansen, 2009)

[11] 1995-1999 are the last years for which mortality data by marital status for Norway are available.

As mentioned, international migration was specified as net immigration. This meant that the vector I_t contains absolute numbers. The distribution of net immigration broken down by age, sex and household position was taken from the earlier household forecast by Keilman and Brunborg (1995), and adjusted proportionally in order to match the number of net immigrants recorded by Statistics Norway in the Norwegian population registers for the years 2002-2006 (the first projection interval in the present analyses).

5. Simulations

This chapter will include the following:

- The household projection for Norway 2002-2032, similar to the one done by Keilman and Christiansen (2009).

- A household projection for the men and women in the age-group 30-49 years being single fathers and mothers 2002-2032.

- Different sensitivity computations carried out in order to investigate how sensitive changes in LIPRO-rates are for the proportion men or women in the age-group 30-49 years being single fathers or mothers.

- Two types of sensitivity variants that consist of counterfactual changes, computed in order to investigate the robustness of the household projection:

    1. Simulation (with changes in LIPRO-rates) computed in order to neutralize the projected change in the proportion men or women in the age-group 30-49 years being single fathers or mothers.
    2. Simulation (with changes in LIPRO-rates) computed in order to neutralize the difference between men and women in the proportion of being a single mother or a single father.

Except from adjustments for consistency, the parameters for household events were assumed constant[12] over the forecast period. In the sensitivity variants, these parameters, or rates, will be changed for the first projection period and then kept constant at the new level throughout

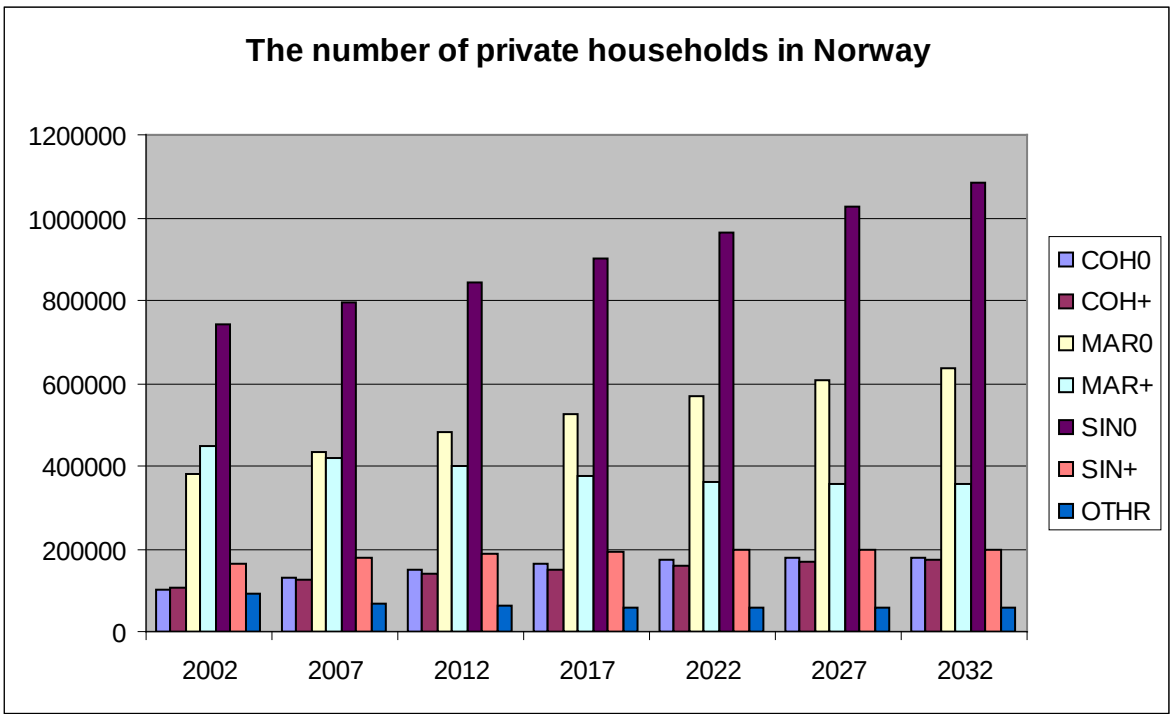
[12] Keilman and Christiansen (2009) found the possible trends visible in the data to be erratic.

the forecast period. The simulations obtained by having all parameters unchanged and constant throughout the whole projection will be referred to as Benchmark, or the Benchmark-simulation, from here onwards.

5.1 The household forecast for Norway 2002-2032

The results of the household projection for Norway indicate a continuation of trends that have been observed for some decades already; fewer couples with children, more cohabiting couples, and more single-person households, as in Keilman and Christiansen (2009). The total number of households is expected to increase by almost one-third, from 2.04 million in 2002 to 2.68 million in 2032. Figure 2 illustrates the trends mentioned above.

Figure 2: *The projected number of private households presented separately*



We see that the amount of households consisting of cohabiting couples is expected to increase, both the ones with and the ones without children. However, the number of

households consisting of a married couple without children is expected to increase with approximately 66 per cent, and the number of households consisting of a married couple with children is expected to diminish by approximately 21 per cent, so that the total number of couples with children is expected to decrease. The number of one-person households is expected to increase, from 744,000 to 1.086 million, which is a 46 per cent increase. The number of households consisting of a single mother or a single father is expected to increase from 163,000 in 2002 to 198,000 in 2032, and this is a projected increase of 21 per cent. The expected change is different for single mothers than for single fathers. This I will return to in my household projection for the men and women in the age-group 30-49 years being single fathers and mothers.

[13]First, by investigating all household positions for the age group 30-49 for men and women separately, the continuation of trends, as mentioned, becomes even more visible. The share of single mothers is to a large extent replaced by a higher share of cohabiting women, both mothers and childless, and by married childless women:

By table 1A (see appendix), we can see that the share of cohabiting women and men is expected to increase in this age group. The proportion of cohabiting women without children increases from 4% in 2002 to 6% in 2032, and the proportion of cohabiting mothers from 13% in 2002 to 19% in 2032. For the men, we see a similar development (from 6% to 8% and from 12% to 19%).

At the same time, the shares of married mothers and fathers are decreasing, from 51% in 2002 to 37% in 2032 for women and from 48% to 31% for men. One reason for this must be that it has become more and more customary with unmarried childbearing and that an increasing number of “informal” families are being established. Such families are exposed to higher disruption risks, which may be the reason for why the number of one-person households and lone-parent households is increasing as well.

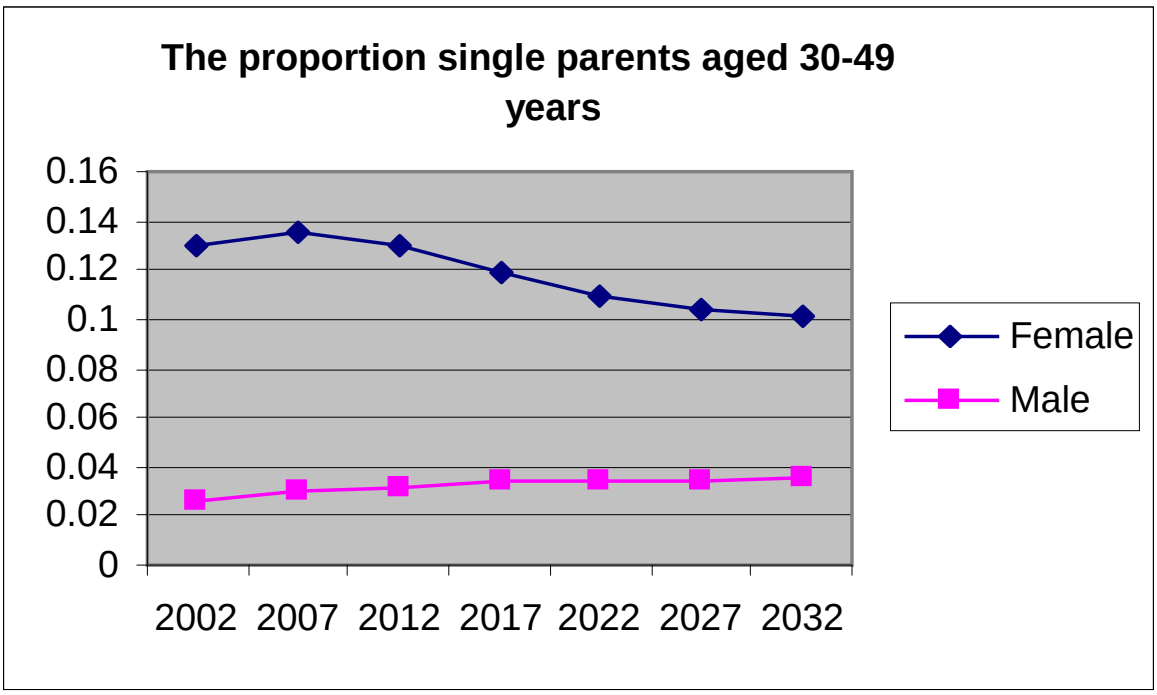
[13] See the appendix for a table displaying the projected change of shares in all household positions, for women and men separately, in the age-group 30-49 years.

However, the share of marital unions without children is rising (Women: from 7% in 2002 to 17% in 2032, Men: from 3% in 2002 to 8% in 2032). More now than earlier women postpone births. As discussed in chapter 2, this may for instance have to do with women's education and/or employment. This postponement of births also has to affect the share of married men and women with children.

5.2 The probability for men/women aged 30-49years being single parents 2002-2032, a household projection

Figure 3 illustrates the results of a household projection for the men and women in the age-group 30-49 years being single fathers and mothers, the Benchmark-simulation.

Figure 3: *The results of the Benchmark-simulation*

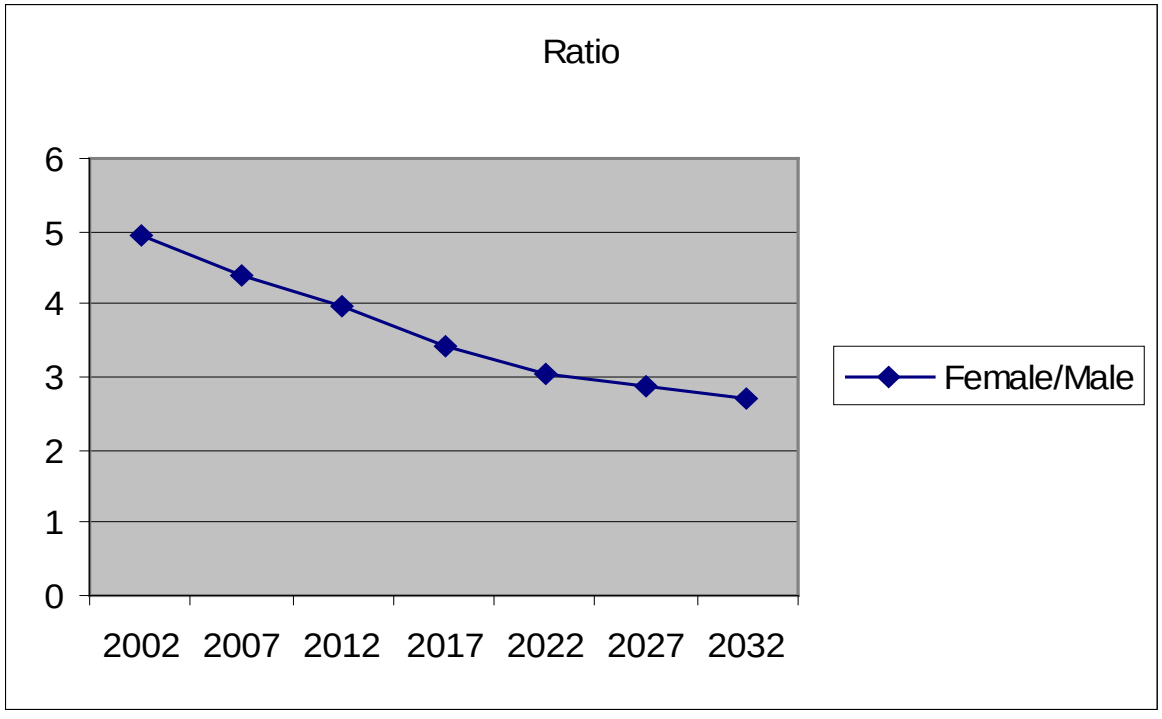


The main aim of this thesis is to make a forecast of the future share of single mothers and fathers in Norway, and to identify the factors that influence the probability of men ending up

as single fathers compared to the probability of women ending up as single mothers after dissolution of parental unions. Most of the people who live in the household position SIN+, either being a single mother or a single father, have experienced dissolution of the union with the other parent of the child(ren). This means that changes in the proportions of single mothers and single fathers says something about changes in the probability for both men and women of ending up as single mothers and single fathers after pair dissolution. In order to investigate which factors that influence these probabilities, I need to find out which of the macro variables that is of the most importance when it comes to the future share of women/men living as single mothers/fathers.

The fact that most of the persons living as single mothers or single fathers have experienced pair dissolution is also the reason for why I have used the age-group 30-49 years in my analyses. Parental unions where the parents are aged 50 years and upwards will often have children who are grown-up or close to grown-up and thus, this group will not be of major interest for my analyses.

Figure 4: *The female/male-ratio of the absolute number of single parents from the Benchmark-simulation.*



From figure 4, we see that the Benchmark-simulation projects a decrease in the female/male-ratio for the age-group 30-49 years. From having five times as many single mothers as single fathers in the jump-off situation, the ratio is expected to diminish by approximately 45 per cent to less than three times as many single mothers than single fathers in 2032. This is due to the fact that the share of single mothers aged 30-49 years decreases from 13 per cent in 2002 to 10 per cent in 2032, while the share of single fathers aged 30-49 years increases from 2.5 per cent in 2002 to 3.5 per cent in 2032. For women, this is a decrease of 22 per cent, while for men this is an increase of 40 per cent. From table 1, we can see that the increase in the proportion single fathers explains more of the decline in the female/male ratio than what the decrease in the proportion single mothers does. This means that the total number of single parent households has to increase, exactly as the population forecast says. The female/male ratio for the proportions displays exactly the same pattern as the one for the absolute numbers – there are small deviations only.

Table 1: *The proportion single parents from the Benchmark-simulation*

	2002	2017	**2032**	**Rel. Change**
Women 30-49	13.0	11.8	10.1	-22.3 %
Men 30-49	2.5	3.4	3.6	39.6 %

When dividing the age group 30-49 in two, and considering the age groups 30-39 and 40-49 separately, as in table 2, we see that the strongest relative changes, and thus also the largest contributions to the change in the female/male ratio, comes from the youngest women, and from the oldest men. In light of the trends that have been visible for decades, particularly with respect to women's enhanced autonomy, and the fact that fathers often are older than mothers, this makes sense.

Table 2: *The proportion single parents from the Benchmark-simulation for different age groups, and the relative changes in the proportions.*

	2002	2017	**2032**	**Rel. Change**
Women 30-39	12.9	9.4	8.2	-36.0 %
Men 30-39	1.6	1.4	1.5	-1.1 %
Women 40-49	13.2	14.0	12.1	-8.5 %
Men 40-49	3.6	5.2	5.9	56.8 %

As mentioned in chapter 2, some studies have shown that preschool children have a stabilizing effect on their parents' relationship, whether they are married or they live in a consensual union. See for instance Steele, Kallis, Goldstein and Joshi (2005), or Andersson (2002). This should imply smaller proportions of single mothers and fathers in the "young" age groups, compared to "older" lone parents.

5.3 Sensitivity variants

Processes of pair dissolution and pair formation are governed by rates that reflect changes in household positions. Movements from the household positions CHLD, SIN0, SIN+, or OTHR to the household positions COH0, MAR0, COH+, or MAR+ represent processes of pair formation. Movements in the opposite direction represent processes of pair dissolution.

Since the focus in this thesis mainly is on changes in the future share, or the future proportion, of single mothers and single fathers, the relevant processes of pair formation and pair dissolution are the ones that involve parental unions. That is the movements SIN+ → COH+ or MAR+, and the movements COH+ or MAR+ → SIN+. Together with the changes SIN+ → SIN0 and SIN0 → SIN+, these are the factors that determine the proportion of SIN+. The movement SIN+ → SIN0 represents the process of the last child of a single parent

household moving out, and the movement SIN0 → SIN+ can be interpreted as a measure of fertility (the relatively rare case of a child returning to a lone parent is also included here).

Since the household projection contains only a few demographic factors at the macro level, there are not many possibilities for a thorough analysis. The various sensitivity variants computed in this thesis are meant to investigate the consequences of higher or lower parameter values for the processes that determine the proportions of single mothers and single fathers. In other words, my strategy is to analyse how sensitive changes in relevant LIPRO-rates are for the share of single mothers and single fathers in Norway. This will give me the answer to the following two questions:

1. Which of the components of change, or processes, is of the most importance to the share of single mothers and fathers?

2. How trustworthy are the forecasted changes in the future shares of women/men being single parents?

The number of men and women summed over all ages who “want to” marry or start a consensual union, and the number of men and women who “want to” divorce his/her spouse or break up with his/her partner, has to be consistent - that is the number has to be the same for both women and men.

However, initial rates lead to inconsistent numbers during a certain projection interval. The two-sex consistency algorithm in LIPRO takes the harmonic mean of these inconsistent numbers, and adjusts initial age-specific numbers up for one sex, and down for the other sex. For this reason, the sensitivity variants in this section have been executed by changing the rates for both sexes in the same way, and at the same time. If I were to change the rates for one sex only, the following results of such sensitivity variants would partly be the consequence of improbable strong imbalances in the marriage and/or the cohabitation market. (Keilman and Christiansen, 2009)

In the fertility variant, SIN0 → SIN+, only the rates for women are changed. Otherwise, the proportion of single fathers would increase as a result of the increased fertility among single women. In all the other sensitivity simulations, the rates are changed in the same manner, and for all ages.

Keilman and Christiansen (2009) find that mortality has an impact on the living arrangements of the elderly. In the present analysis, however, I deal with men and women aged 30-49 years. The sex-difference in mortality will not make a considerable difference for this age-group, and thus changes in mortality rates are not deployed.

In the table below I will go through the sensitivity variants I found relevant in order to answer my question on which of the processes of change of household position that is of the most importance. In the simulations, all other rates than the ones changed have been kept at the benchmark level, and all rates, both the ones changed and the ones kept at the benchmark level, are kept constant throughout the forecast period.

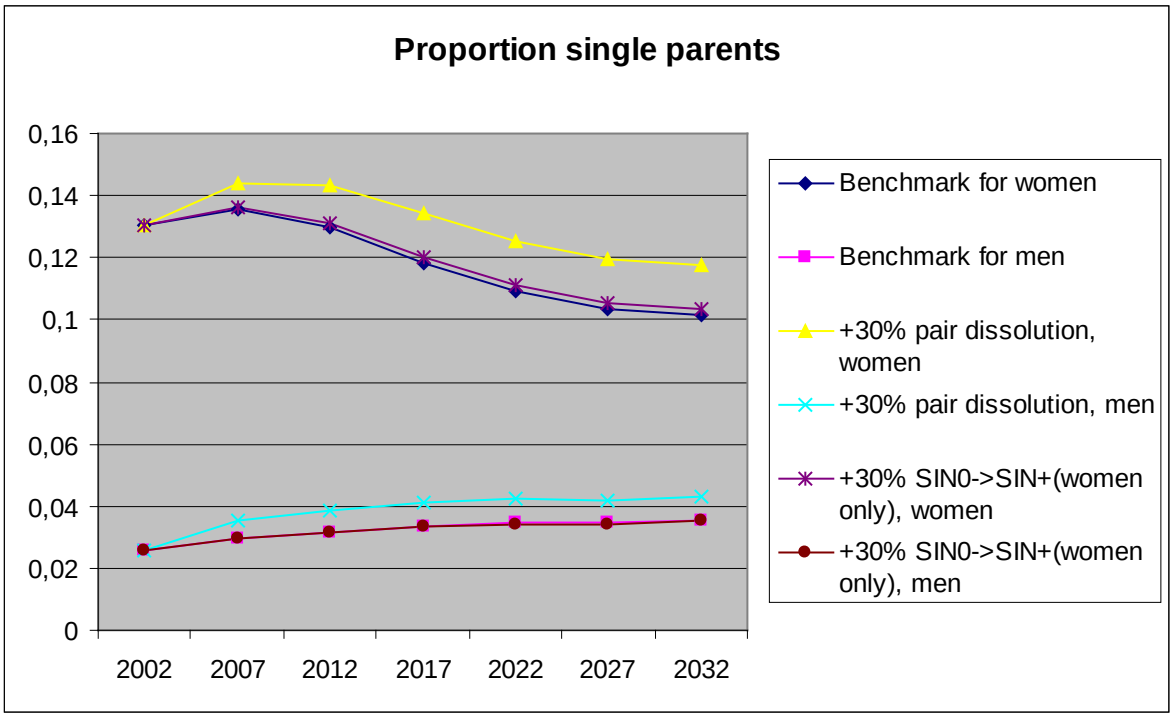
Table 3: *The various relevant sensitivity variants*

Entries into SIN+	**Explanation**
1. +30% pair dissolution	1. Occurrence-exposure rates for the processes COH+→SIN+ and MAR+→SIN+ are increased by 30%
2. +30% marriage dissolution (separations included)	2. Occurrence-exposure rates for the process MAR+→SIN+ are increased by 30%
3. +30% diss. of consensual unions	3. Occurrence-exposure rates for the process COH+→SIN+ are increased by 30%
4. +30% fertility	4. Occurrence-exposure rates for the process SIN0→SIN+ are increased by 30% (for women only)
Exits from SIN+	**Explanation**
5. -30% pair formation	5. Occurrence-exposure rates for the processes SIN+→MAR+ and SIN+→COH+ are decreased by 30%
6. -30% marriage	6. Occurrence-exposure rates for the process SIN+→MAR+ are decreased by 30%
7. -30% cohabitation	7. Occurrence-exposure rates for the process SIN+→COH+ are decreased by 30%
8. -30% last child moving out	8. Occurrence-exposure rates for the process SIN+→SIN0 are decreased by 30%

When performing separate changes of the parameter values for both sexes simultaneously, in opposite directions, but with the same amount, the impact on the share of single mothers and fathers will be of the same magnitude, but with opposite signs. For this reason, I have chosen the relevant sensitivity computations to be the ones that lead to an increase in the proportion of single mothers and the proportion of single fathers. For entries into SIN+, this is represented by positive changes, while for exits from SIN+, this is negative changes. The 30% alteration of the occurrence-exposure rates is the result of smaller changes having a

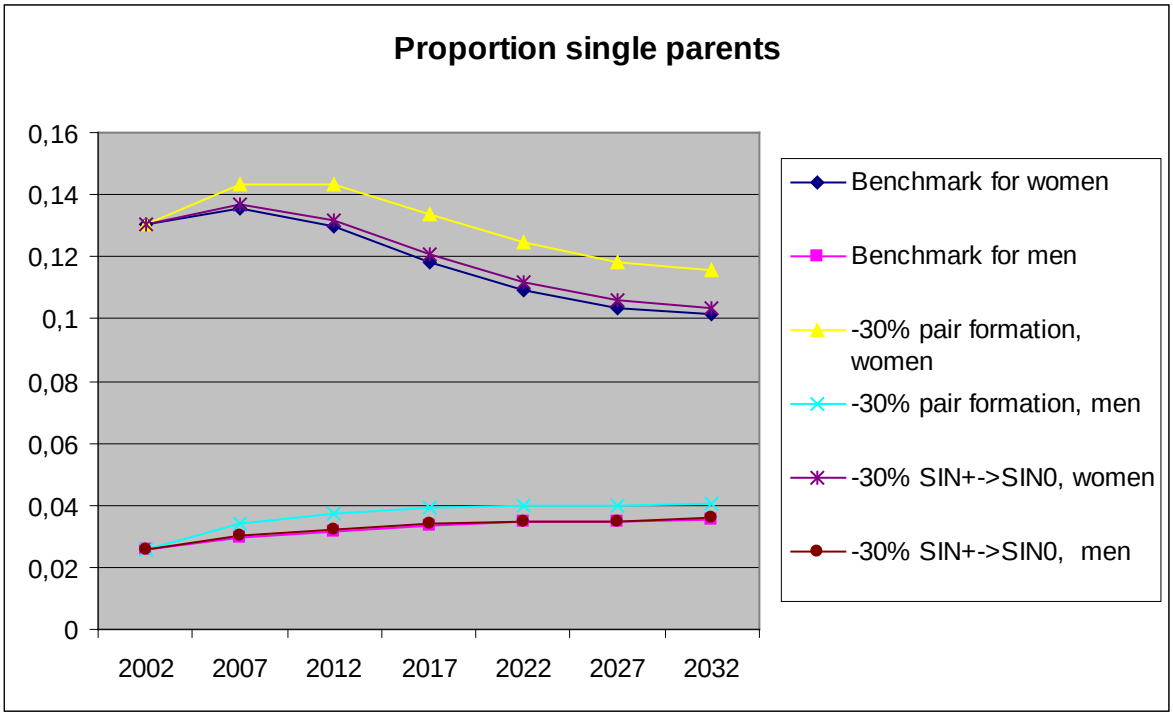
small impact on the future share of men and women living as single parents. The changes are counterfactual, but serve the purpose of answering my above mentioned questions.

Figure 5: *The results of increasing the rates for entries into SIN+ by 30%*[14]



[14] Here, and in other graphs later, comma's are meant to be decimal points.

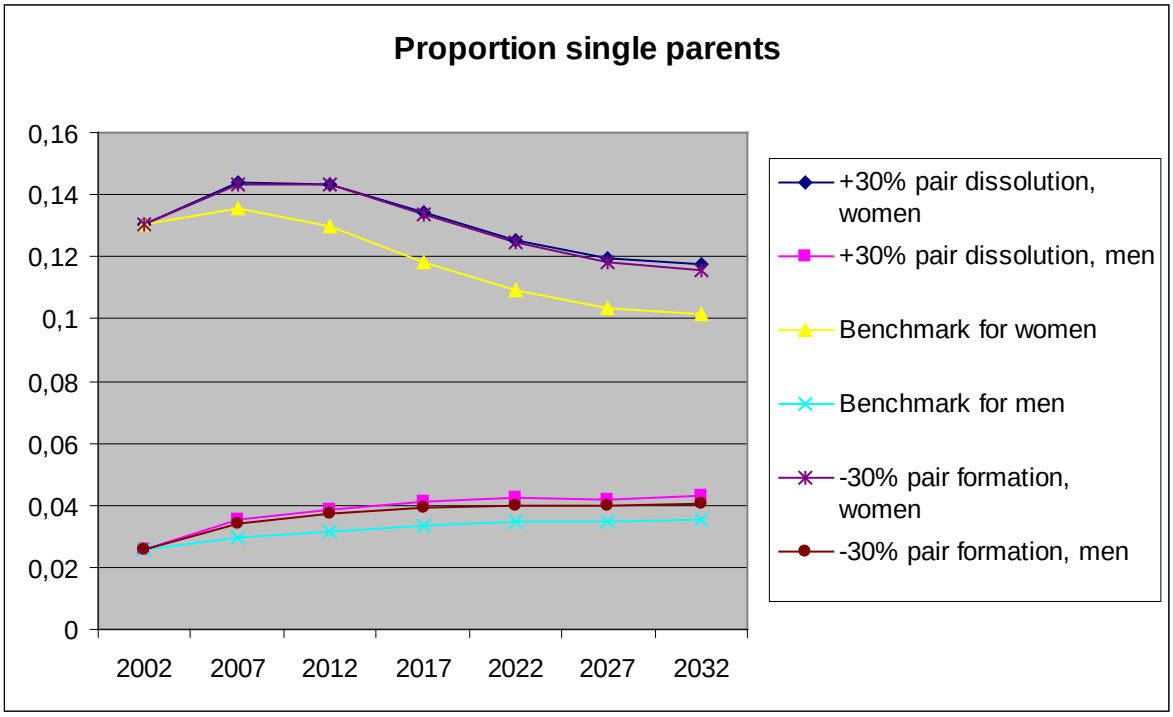
Figure 6: *The results of decreasing the rates for exits from SIN+ by 30%*



From figure 5 and figure 6, we see that the processes of change of household position that are of the most importance for the share of single parents are the ones that involve pair dissolution and pair formation, as expected. This is the case for both men and women.

However, the general pattern is the same as in the Benchmark simulation. Since the changes computed in the sensitivity variants is counterfactual (improbable large), the forecasted change in the proportions of single mothers and fathers, the forecasted change in the female/male ratio, seems to be real. This indicates that the household projection is trustworthy, even though the shares may be higher or lower in 2032 compared to the Benchmark levels.

Figure 7: *Comparing total pair formation and total pair dissolution with Benchmark*



From figure 7 we see that when increasing the rates for pair dissolution by 30 per cent, this leads to a slightly larger impact on the share of single parents, both for men and for women, than when decreasing the rates for pair formation by 30 per cent. But differences are small, even in the long run. That is, pair dissolution is slightly more important for the share of single parents than pair formation. If this was not the case, it would imply that if I were to change the rates for both pair formation and pair dissolution, simultaneously and in the same direction, this would lead to a zero deviation from the benchmark situation. In table 4, the results of the two possible simulations of this kind are displayed, presented as their percentage point deviations from Benchmark values.

Table 4: *The proportion single parents in the Benchmark simulation, and percentage points deviations from Benchmark values in the two simulations that represents simultaneous changes in the rates for pair dissolution and pair formation of the same kind.*

	% single mothers aged 30-49 years				**% single fathers aged 30-49 years**		
	2002	2017	**2032**		**2002**	2017	**2032**
Benchmark	13.0	11.8	10.1		2.5	3.4	3.6
+30% pair dissolution, combined with +30% pair formation		+0.3	+0.3			+0.3	+0.3
-30% pair formation, combined with -30% pair dissolution		-0.4	-0.6			-0.3	-0.4

The deviations are computed as the value in the sensitivity variant minus the Benchmark value. In relative terms, these deviations are notably large, in particular for men. In table 5, later in this thesis, one can see that for women cohabitation is more important for the share of single parents than dissolution of consensual unions. However, total pair dissolution is more important than total pair formation.

It makes sense that pair dissolution is more important for the share of single parents than pair formation. Every parent who experiences pair dissolution has to become either single, or a single parent. It is, however, not certain that every parent experiencing pair dissolution will re-marry, or enter a new consensual union. Nevertheless, in many cases, countries with a relatively high prevalence of parental dissolution also exhibit higher levels of formation of new stepfamilies than other countries do (Andersson, 2002).

One observation, as mentioned in chapter 2, is that second marriages have higher dissolution risks than first marriages, see for instance Kravdal and Noack (1988).

Figure 8: *Illustration of the possible entries into, and exits from, SIN+*

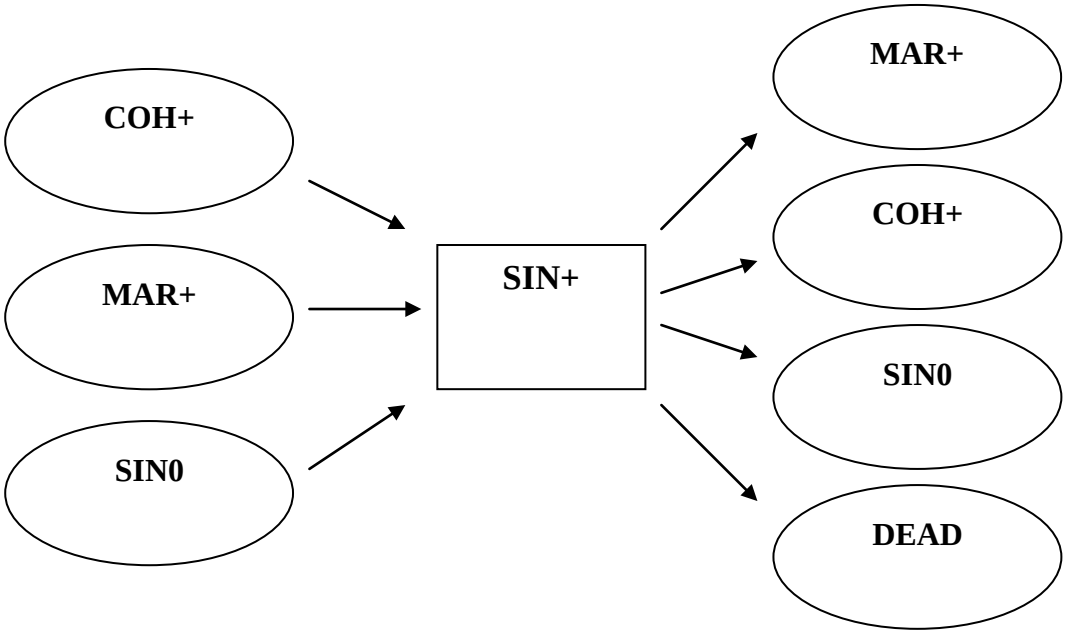


Table 5: *The proportion single parents in the Benchmark simulation, and percentage points deviations from Benchmark values, in relative terms, in the most important sensitivity variants.*

	% single mothers aged 30-49 years				**% single fathers aged 30-49 years**		
	2002	2017	**2032**		**2002**	2017	**2032**
Benchmark	13.0	11.8	10.1		2.5	3.4	3.6
1. +30% pair dissolution		+13.3	+15.8			+22.5	+21.9
2. +30% marriage dissolution		+5.8	+5.6			+7.4	+5.8
3. +30% dissolution of consensual unions		+7.4	+10.2			+15.0	+16.1
4. +30% SIN0 → SIN+		+1.3	+1.9			-0.5	-1.2
5. -30% pair formation		+13.1	+14.4			+16.2	+14.5
6. -30% marriage		+3.1	+3.0			+5.9	+5.6
7. -30% cohabitation		+9.5	+10.8			+9.1	+7.8
8. -30% SIN+ → SIN0		+2.0	+2.0			+1.3	+1.2

From table 5, we see that out of the two possibilities for pair dissolution, dissolution of consensual unions is of the most importance for the future share of single parents. For pair formation, the pattern is the same; marriage seems to be of less importance than cohabitation. See figures 9 and 10 for an illustration.

The deviations in table 5 are computed as the relative changes in the various sensitivity variants compared to the Benchmark level. That is ((NP-BP)/BP)*100%, where

NP = the new proportion in the sensitivity variant

BP = the Benchmark proportion

Figure 9: *Comparing marriage and cohabitation*

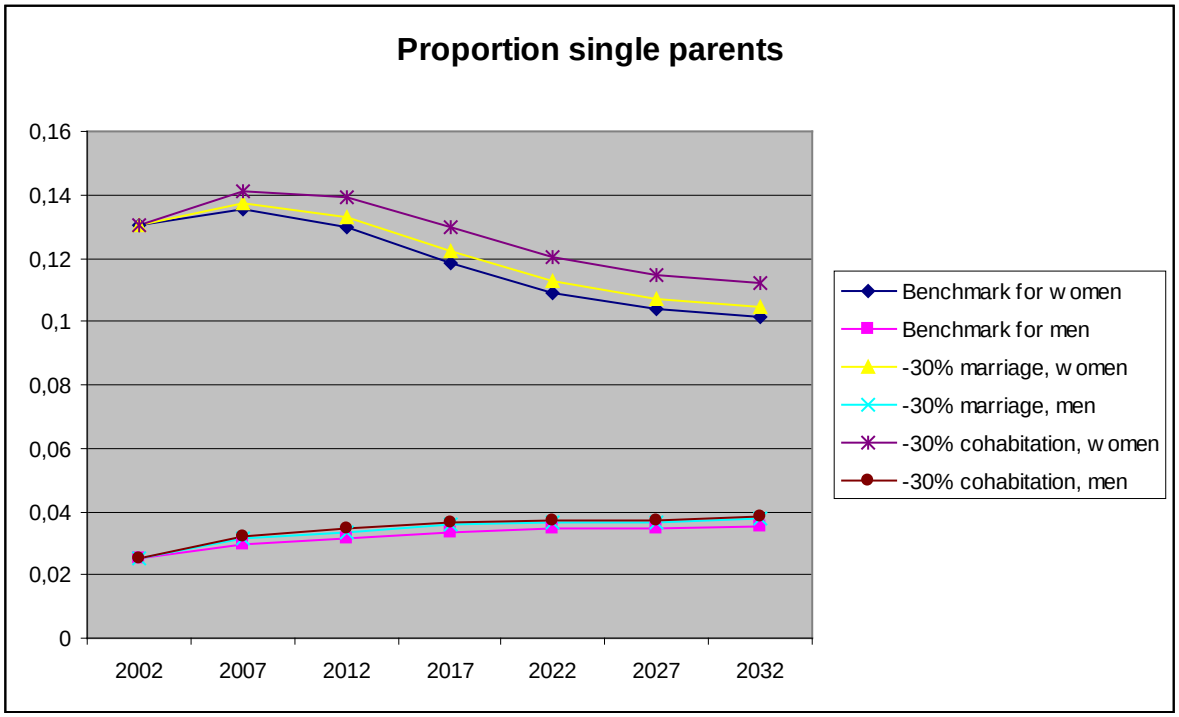
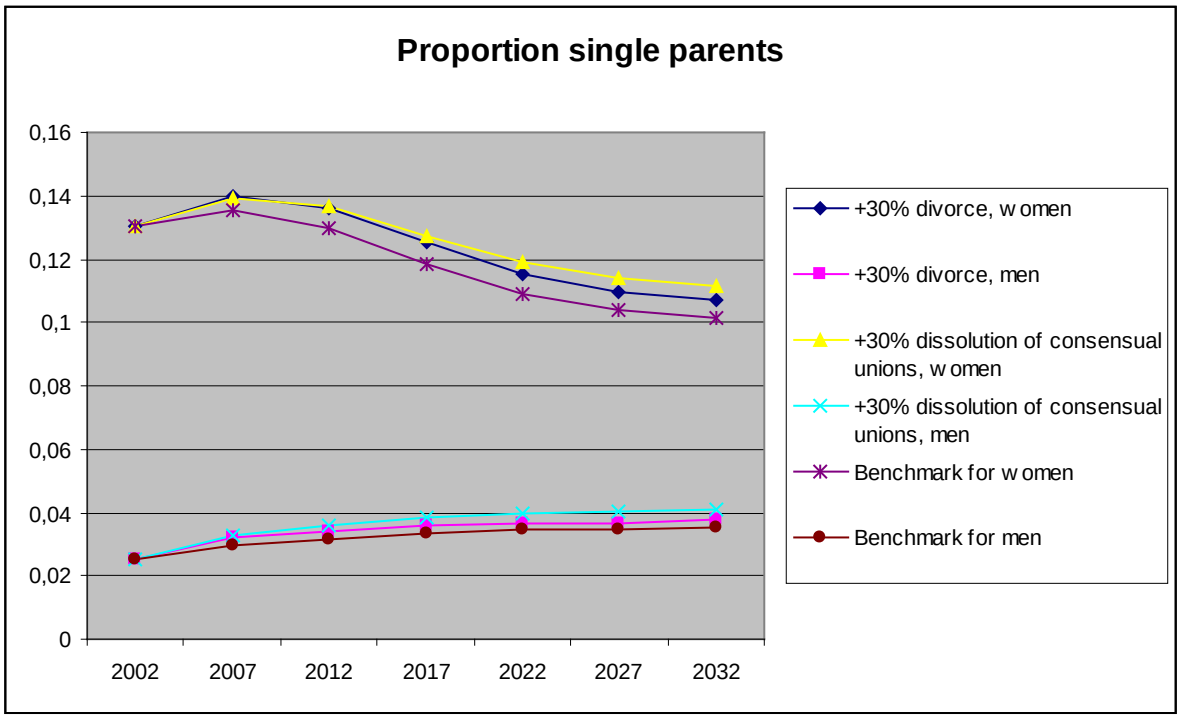


Figure 10: *Comparing divorce and dissolution of consensual unions*



Since the population forecast projects more cohabiting couples in the future, the above mentioned results are important. They also match findings in the literature; children born in cohabitation are exposed to higher disruption risks than children born in marriage (Andersson, 2002). Several other studies (e.g Hoem and Hoem, 1992) show similar results, and make their consent to what is an established demographic fact, namely that marital unions are much more stable than non-marital unions. More frequent pair dissolution for cohabiting couples with children than for married couples with children explains to a large extent the higher number of single person households and single parent households that is projected in the present population forecast. These demographic developments may be of policy interest, and important for the design and structure of social security in Norway in the future.

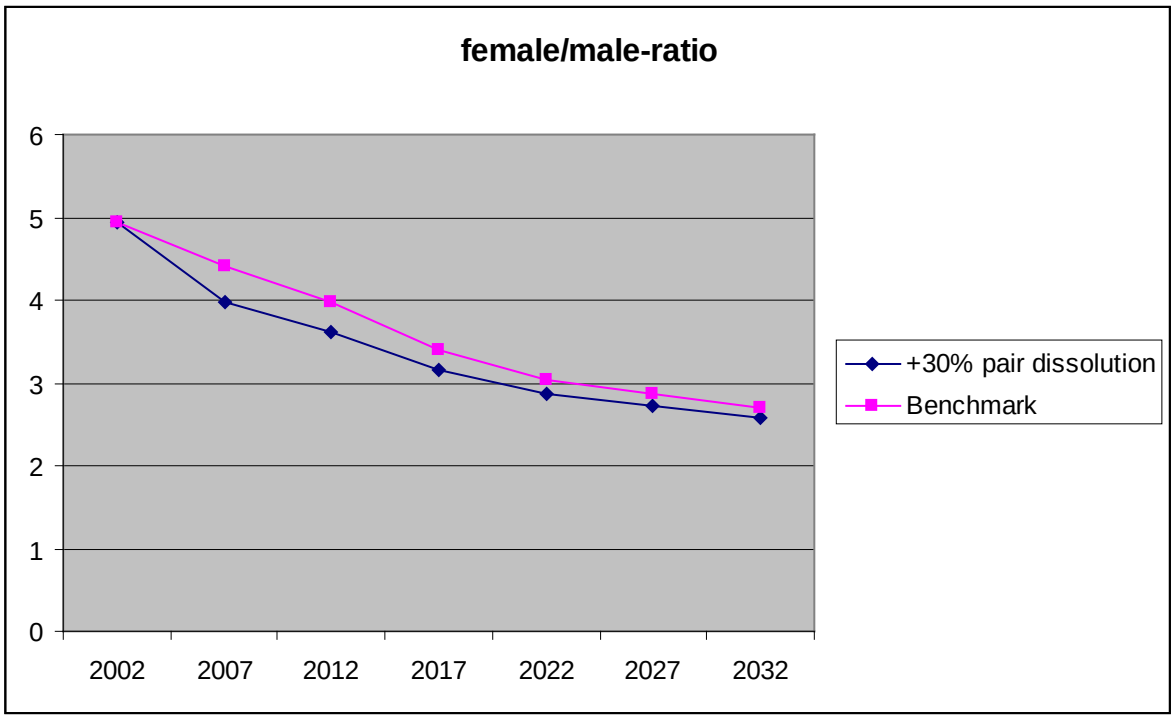
As the proportions of single mothers and single fathers change in my various sensitivity variants, it is possible to find the macro variables that are important for this share. However, in the sensitivity variants, the future female/male ratio for the number of single parents does not deviate to a large extent from the future female/male ratio that is projected in the Benchmark simulation. In other words, the general pattern is the same, and the macro variables that are of the most importance are just as important for women as they are for men.

5.4 *Changes in LIPRO-rates that are dependent of sex*

We have seen that the Benchmark simulation projects a smaller female/male-ratio for the number of single parents in the age-group 30-49 years, approximately from a ratio of 83/17 (odds ca 5 to 1) to a ratio of 73/27 (odds ca 3 to 1). By changing the rates for entries into/exits from SIN+, we have discovered which of the processes that is of the most importance to the proportion of single parents.

However, the general patterns are the same, and the trends which my household projection display are pretty much seen to be equal in the various sensitivity simulations. This is due to the fact that the rates for both men and women are changed simultaneously, and in the same manner. Thus, the sensitivity computations lead to changes in the proportions of single mothers and fathers that are of the same sign for both sexes. When looking at the female/male-ratio for the future number of single parents in the various sensitivity simulations, this comes clear: only small changes in this ratio are discovered. Figure 11 illustrates this.

Figure 11: *The female/male-ratio of the absolute number of single parents. Benchmark simulation compared to the +30% pair dissolution simulation.*



In figure 11, we see that the female/male ratio quickly deviates from the Benchmark, but then after a while it seems to have adopted the same trend. According to stable population theory, this is what one should expect. In multistate models, when rates are constant (as here), any jump-off population will converge to a stable population. See for instance Rowland (2003). Possible irregularities in the jump-off population will be dampened exponentially over time.

This section will consist of two different sensitivity variants. They are computed in order to investigate the robustness of my household projection. I will try to answer the following two questions:

1. How large changes in the LIPRO-rates that are of the most importance for the share of single parents, compared to the Benchmark, are necessary in order to neutralize the projected change in the female/male-ratio for the number of single mothers and fathers. In other words, how large changes in Benchmark rates are necessary to have the same level for the female/male-ratio in 2032 as in the jump-off situation?

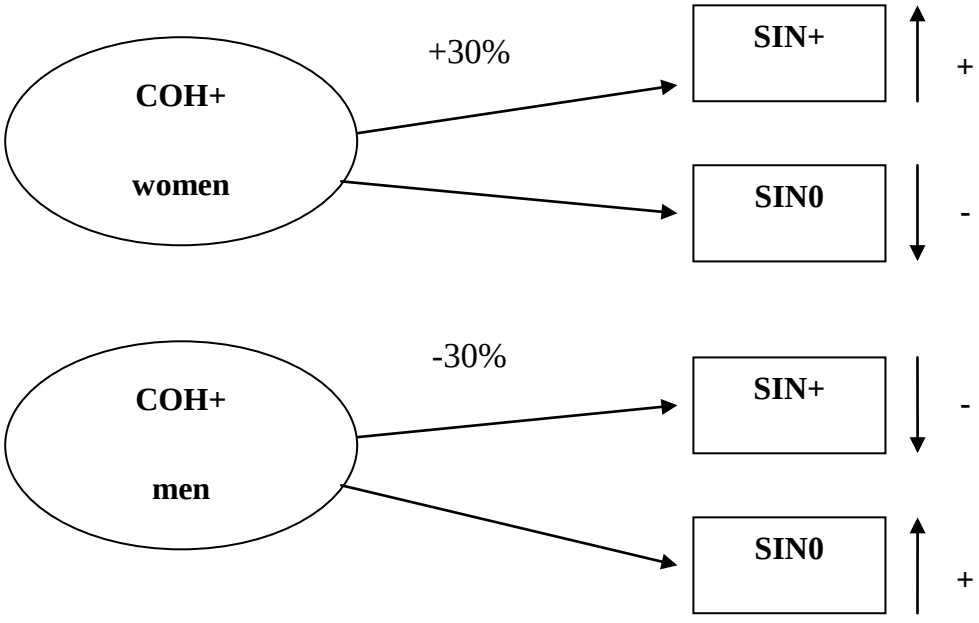
2. How large changes in the LIPRO-rates that are of the most importance for the share of single parents, compared to the Benchmark, are necessary in order to neutralize the difference between men and women in the number of single parents at the end of the forecast period. That is how large changes in Benchmark rates is necessary to have a female/male-ratio of one in 2032, a fifty-fifty situation in the number of single mothers and single fathers.

If the changes necessary to solve these two questions are unrealistic, the forecasted decrease in the female/male-ratio for the age-group 30-49 years is real, although it could be weaker or stronger than 45%.

When working on this, I discovered that it would not be possible to answer the questions above and at the same time hold on to the constraint of altering the rates for pair formation and pair dissolution in the same manner for both men and women. In other words, I had to change my strategy of for instance increasing the occurrence-exposure rate for the event COH+ → SIN+ with the same amount for both men and women into changing the rate in different directions for men and women. In doing so, the results are partly the consequence of improbably strong imbalances in the marriage and the cohabitation market, and thus the changes are counterfactual.

However, the consistency algorithm in LIPRO includes a two-sex constraint that ensures that the number of men that experiences either pair dissolution of any kind, or pair formation of any kind, has to be equal to the number of women that experiences the same events. LIPRO solves this in the following way: When for instance increasing the rate for the event COH+ → SIN+ for men, and decreasing the rate for the event COH+ → SIN+ for women, LIPRO adjusts the occurrences of the event COH+ → SIN0 for men down, and the occurrences of the event COH+ → SIN0 for women up. That is, the consistency algorithm ensures that the occurrence-exposure rate for the event COH+ → SIN0 is decreased for men, and increased for women. These adjustments make sure that the number of women and men who experiences pair dissolution are the same. Figure 12 is meant to illustrate this.

Figure 12: *The possible outcomes (excepts deaths) of dissolution of a consensual union; effects of, and adjustments made in LIPRO to ensure consistency after, changing the rates of the event COH+ →SIN+ in different manners for men and women.*



In order to answer the first question, more lone mothers and fewer lone fathers are necessary. Hence I tried to find a number $0<K<1$, such that changing rates for the events

- COH+ → SIN+ and MAR+ → SIN+ for women by a factor (1+K), and
- COH+ → SIN+ and MAR+ → SIN+ for men by a factor (1-K),

would lead to a neutralization of the projected decrease in the female/male ratio for the number of single mothers and fathers in 2032.

In answering the second question, more lone fathers and fewer lone mothers are required. Thus I tried to find a number $0<K<1$, such that changing rates for the events

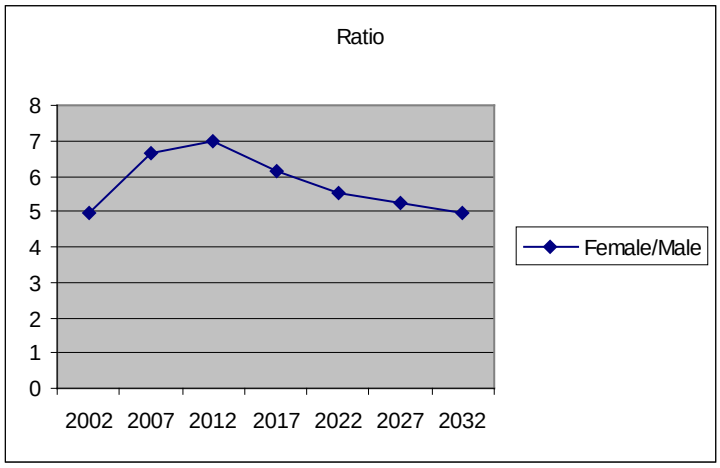
- COH+ → SIN+ and MAR+ → SIN+ for women by a factor (1-K), and
- COH+ → SIN+ and MAR+ → SIN+ for men by a factor (1+K),

would lead to a neutralization of the projected difference in the number of single mothers and fathers in 2032.

Trial and error gave me the answers $K = 0.78$ for the first question and $K = 0.97$ for the second question.

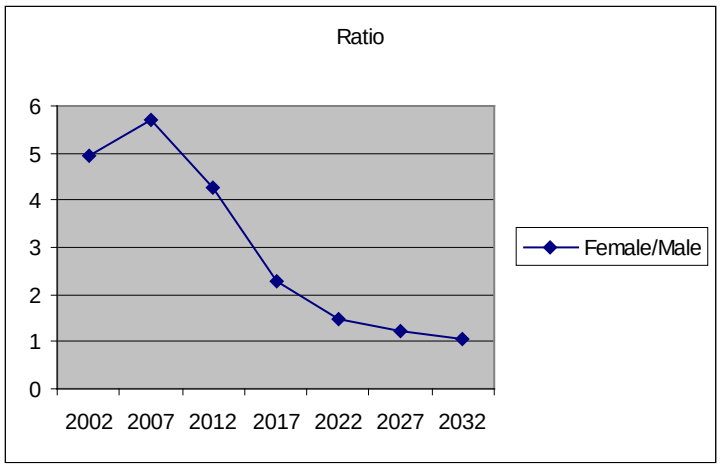
$K = 0.78$ means that in order to keep the female/male ratio at its jump-off level in 2032, the rates for the events MAR+ → SIN+ and COH+ → SIN+ for women have to increase with 78%. At the same time, the rates MAR+ → SIN+ and COH+ → SIN+ for men have to be reduced to 22% of their original values. This seems rather unrealistic, and I regard the projected decrease in the female/male ratio for the number of single mothers and fathers as being real, even though its level may be higher or lower.

Figure 13: *Neutralization of the projected decrease in the female/male ratio.*



K = 0.97 means that in order to get a female/male-ratio of one in 2032, the rates MAR+ → SIN+ and COH+ → SIN+ for women have to be reduced to 3% of their original values. The rates MAR+ → SIN+ and COH+ → SIN+ for men have to almost double. Again, this is unrealistic, and a fifty-fifty situation in the number of single mothers and single fathers seems like an impossible situation.

Figure 14: *Neutralization of the projected difference in the number of single mothers and fathers.*



6. Conclusions

An increasing number of parental unions are being dissolved in Norway, and the majority of single-parent families are the outcome of partnership dissolution, rather than unpartnered motherhood. Children cope with the aftermath of family disruption in different ways, depending on the circumstances concerning the dissolution process and their personal characteristics. Nevertheless, the dissolution of a parental union is shown to be detrimental to the well-being of the children involved. Factors such as the number of children in a union, children's age, gender relations, employment status, etc. seem to affect the stability of parental unions.

This thesis has investigated the future household structure among adults in Norway. The results of the household projection for Norway from 2002 and through to 2032 indicate a continuation of trends that have been observed for some decades already; namely fewer couples with children, more cohabiting couples, and more single-person households.

My household forecast is for the men and women in the age-group 30-49 years being single fathers and mothers in Norway for the years 2002-2032. This household projection shows an increase in the men's probability of being a single parent in the future, while the reverse is seen for women. For women, the relative decrease in the share is 22%. For the men, the relative increase in the Benchmark-simulation is 40%.

My different sensitivity variants helped me to understand how sensitive changes in relevant LIPRO-rates are for the share of single mothers and single fathers in Norway. Pair dissolution was of more importance than pair formation, and divorce and marriage of less significance than dissolution of consensual unions and cohabitation. These results consent to other findings in the literature.

Women are more likely to become single mothers than men are likely to become single fathers. This has to do with traditional gender roles. However, my model framework could not explain why the share of single mothers is expected to decrease while the share of single fathers is expected to increase.

So, why are men more likely to live as lone parents in the future and why are women showing a decrease in the probability of ending up as single mothers? One possibility, that might influence the share of single fathers, is effects of the law on parental leave. Fathers who take parental leave have traditionally been regarded as more family oriented compared to those who don't. Fathers who are more involved in childrearing may develop special bonds to their children, and the probability of such fathers ending up as tending parents after pair dissolution may be higher than for "passive" fathers.

The very same factors that lead women to postpone children and marriage in a larger scale now than a few years back may be important in this case as well. The increasing number of women who attain education, as compared to men, has improved the women's employment status. More women pursuing a job-career and more and more female "bread-winners" may change attitudes toward the importance of a traditional mother in the family even further. In chapter 2, I showed that employment status is important for disruption risks. Some of the factors that influence the dissolution of unions should play a role after the family disruption as well, regarding whether or not a former partner takes on the responsibility of raising the children. According to this reasoning, perhaps more fathers will play the role of the traditional mother in the future.

According to my robust-check on the forecasted future shares of single parents, on the female/male ratio, the household projection should be trusted, at least qualitatively, i.e. the direction of the projected trends. As we know that 3 out of 4 receivers of social security in Norway are single, and that the share of lone-parent receivers is rising, my findings are upsetting.

References

Amato, P.R. (1993): “Children’s Adjustment to Divorce: Theories, Hypotheses, and Empirical Support”, *Journal of Marriage and the Family*, 55 (1): 23-38.

Amato, P.R. (2000): “The Consequences of Divorce for Adults and Children”, *Journal of Marriage and the Family*, 62 (4): 1269-1287.

Berrington, A. and I. Diamond (1999): “Marital Dissolution among the 1958 British Birth Cohort: The Role of Cohabitation”, *Population Studies*, 53 (1): 19-38.

Brown, S.L. (2006): “Family Structure Transitions and Adolescent Well-Being”, *Demography*, 43 (3): 447-461.

Bumpass, L. and H. Lu (2000): “Trends in Cohabitation and Implications for Children's Family Contexts in the United States”, *Population Studies*, 54 (1): 29-41.

Andersson, G. (2002): “Children's experience of family disruption and family formation: Evidence from 16 FFS countries”, *Demographic Research*, 7 (7): 343-364.

Cherlin, A.J, K.E. Kiernan, and P.L. Chase-Lansdale (1995): “Parental Divorce in Childhood and Demographic Outcomes in Young Adulthood”, *Demography*, 32 (3): 299- 318.

Christiansen, S. (2008): “The impact of mortality on the future living arrangements of the elderly”, Master thesis at the Department of Economics, University of Oslo.

Hoem, B. and J.M. Hoem (1992): “The disruption of marital and non-marital unions in contemporary Sweden”, *Demographic Applications of Event History Analysis,* Clarendon Press, 61-93.

Van Imhoff, E. (1992): “A general characterization of consistency algorithms in multidimensional demographic projection models”, *Population Studies*, 46 (1): 159-169.

Van Imhoff, E. (1995): “LIPRO: A Multistate Household Projection Model”, In *Household Demography and Household Modelling”*, Van Imhoff, E, A. Kuijsten, P. Hooimeijer, L.J.G Van Wissen (Eds.), Plenum Press, 273-291.

Van Imhoff, E. and N. Keilman (1991): *LIPRO 2.0: An Application of a dynamic demographic projection model to household structure in The Netherlands. Amsterdam: Swets & Zeitlinger*.

Keilman, N. and H. Brunborg (1995): “Household Projections for Norway 1990-2020”, Statistics Norway (Report 95/21).

Keilman, N. and S. Christiansen (2009): “Norwegian elderly less likely to live alone in the future”, Accepted for publication by *European Journal of Population*, http://folk.uio.no/keilman/householdEJP.pdf .

Kiernan, K.E. and A.J. Cherlin (1999): "Parental Divorce and Partnership Dissolution in Adulthood: Evidence From a British Cohort Study", *Population Studies*, 53 (1): 39-48.

Kravdal, Ø. and T. Noack (1988): ”Skilsmisser i Norge 1965–1985. En demografisk analyse”, Statistics Norway (Report 88/6).

Oláh, L.S. (2001): ”Gender and family stability: Dissolution of the first parental union in Sweden and Hungary”, *Demographic Research*, 4 (2): 29-96.

Rendall M.S.(1999): “Entry or Exit? A Transition-Probability Approach to Explaining the High Prevalence of Single Motherhood among Black Women”, *Demography*”, 36 (3): 369-376.

Rowland D.T. (2003): "Stable and stationary models", *Demographic methods and concepts*, Oxford University Press Oxford University Press, 300-339.

Steele, F., C. Kallis, H. Goldstein, and H. Joshi. (2005): ”The Relationship between Childbearing and Transitions from Marriage and Cohabitation in Britain”, *Demography*, 42 (4): 647-673.

Teachman, J.D. (2002): "Stability across Cohorts in Divorce Risk Factors", *Demography*, 39 (2): 331-351.

Vignoli, D. and I. Ferro. (2009): "Rising marital disruption in Italy and its correlates", *Demographic Research*, 20 (4): 11-36.

Appendix

Figure 1A: *All 8 sensitivity variants for women compared to Benchmark.*

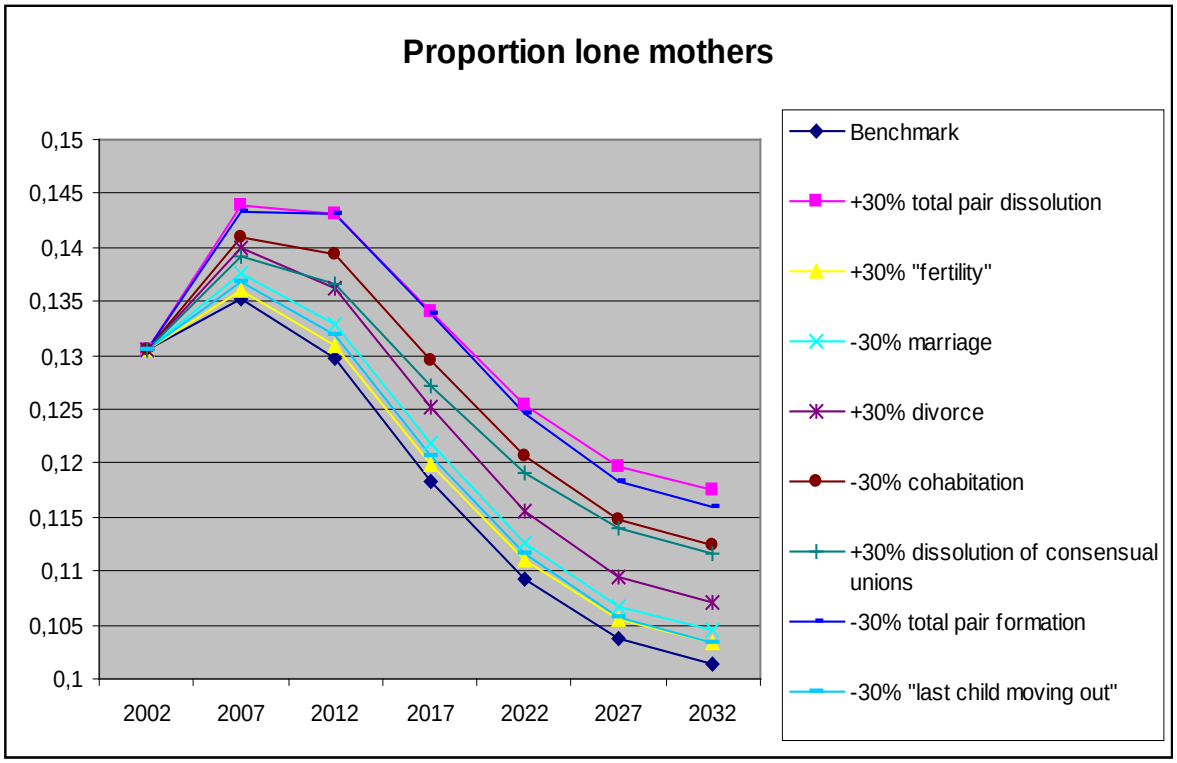


Figure 2A: *All 8 sensitivity variants for men compared to Benchmark.*

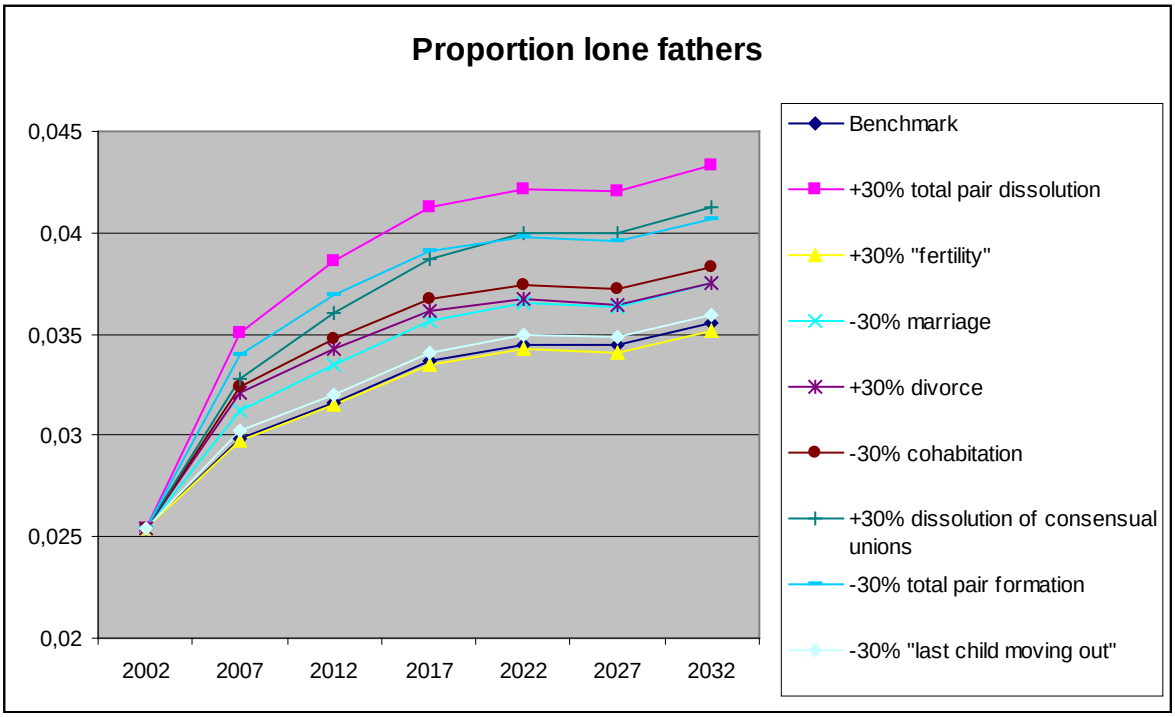


Table 1A: *The future share of all household positions, for the age-group 30-49 and for both men and women.*

POSITION	***2002***	***2007***	***2012***	***2017***	***2022***	***2027***	***2032***
W: COH0	**4.0 %**	4.8 %	**5.0 %**	5.5 %	**6.1 %**	6.3 %	**6.2 %**
W: COH+	**13.0 %**	15.2 %	**16.7 %**	17.8%	**18.8 %**	19.3 %	**19.3 %**
W: MAR0	**6.5 %**	9.7 %	**12.7 %**	14.9 %	**16.0 %**	16.3 %	**16.8 %**
W: MAR+	**51.2 %**	46.8 %	**42.7 %**	39.9 %	**37.5 %**	36.7 %	**37.0 %**
W: SIN0	**10.0 %**	9.0 %	**8.9 %**	9.3 %	**9.8 %**	9.9 %	**9.7 %**
W: SIN+	**13.0 %**	13.5 %	**13.0%**	11.8 %	**10.9 %**	10.4 %	**10.1 %**
W: OTHR	**2.2 %**	1.1 %	**1.0 %**	0.9 %	**1.0 %**	1.0 %	**0.9 %**
M: COH0	**6.1 %**	7.3 %	**7.8 %**	8.2 %	**8.6 %**	8.7 %	**8.5 %**
M: COH+	**12.2 %**	14.3 %	**16.3 %**	17.6 %	**18.6 %**	19.0 %	**19.0 %**
M: MAR0	**3.3 %**	5.2 %	**7.1 %**	8.3 %	**8.5 %**	8.5 %	**8.4 %**
M: MAR+	**47.7 %**	42.1 %	**37.6 %**	34.1 %	**31.4 %**	30.5 %	**30.6 %**
M: SIN0	**21.1 %**	23.5 %	**24.5 %**	25.5 %	**26.3 %**	26.7 %	**27.0%**
M: SIN+	**2.5 %**	3.0 %	**3.2 %**	3.4 %	**3.5 %**	3.4 %	**3.6 %**
M: OTHR	**7.1 %**	4.8 %	**3.5 %**	3.1 %	**3.1 %**	3.1 %	**3.0 %**